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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

*Ex Parte*

Ms. Magalie Roman Salas
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

> Re:  *Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions
> to Part 27 of the Commission's Rules – WT Docket No. 99-168*

Dear Ms. Salas:

This notice of a written *ex parte* presentation in the above-referenced proceeding is provided for inclusion in the public record in accordance with the Commission's *ex parte* rules.

Please associate the attached letter to Mr. Joel Rabinovitz with the above-captioned proceeding and direct any questions regarding this matter to the undersigned.

Sincerely,

Karen B. Possner

Attachment

No. of Copies rec'd 0t 2
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July 13, 2000

*Ex Parte*

Mr. Joel Rabinovitz
Attorney Advisor
Auctions Division
Wireless Telecommunications Bureau
Federal Communications Commission
445 12<sup>th</sup> Street, S.W., Room 3-A421
Washington, D.C. 20554

      Re:    *Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules – WT Docket No. 99-168*

Dear Mr. Rabinovitz:

      Thank you for agreeing to arrange a meeting with FCC staff to discuss the procedures implementing package bidding for Auction No. 31.

      Enclosed, as discussed, is a list of questions prepared on behalf of BellSouth and SBC. As prospective bidders, we feel strongly that we will not be able to proceed with confidence to devise a rational bidding strategy (and back up strategies) unless the ambiguities and inconsistencies we have identified in the attached request for clarification are cleared up before August 1<sup>st</sup>, the filing date for Form 175.

      Thank you for your attention to this matter.

                    Sincerely,

Attachment

**Request for Clarifications of:**

**PROCEDURES IMPLEMENTING PACKAGE BIDDING FOR AUCTION NO. 31**

**JOINT EX PARTE COMMUNICATION OF SBC WIRELESS, INC.**

**AND BELLSOUTH CELLULAR CORP.**

1. We would like to confirm that individual licenses do not constitute a package. The Procedures PN (Report No. AUC-00-31-H, Public Notice DA 00-1075, released July 3, 2000), at section I.B.2, at 5, states: "Bidders will be permitted to create and bid on up to twelve different packages of their own choosing during the course of the auction." We suspect that the Commission does not intend for a bid on an individual license to be considered as one of the twelve packages. However, the Procedures PN includes references that suggest clarification is warranted. For example, the paragraph immediately preceding the one quoted above discusses 4,095 "combinations of licenses" or "possible packages." There are 4,095 possible packages of one license or more, but only 4,083 possible packages if a package must consist of at least two licenses. There are additional examples of verbiage that introduces ambiguity including, among others: (1) part (ii) of the minimum accepted bid rule, i.e., "the bidder's own previous high bid on that package plus x%, where the Bureau will specify the value of x in each round;" (2) the fifth and sixth paragraphs of section II.B.6.b, (e.g., "other bidders on a smaller package attempting to beat a large package"—in this context, an individual license may be a "smaller package"); and (3) section II.B.4 is written

as if an individual license is a special case of a package, or else a bidder may place "last-and-best bids" only on packages.

The reverse ambiguity arises in other places in the Procedures PN: (1) the first two paragraphs of section II.A.6 imply that a new bid on an individual license keeps the auction open, but do not say whether a new bid on a package also keeps the auction open; and (2) section II.B.5's last paragraph similarly is written as if it only applies to individual licenses, although we suspect the Commission intended "renewed bids" to apply to packages, also. We seek confirmation on this.

2. Please clarify certain aspects of the application of the minimum accepted bid rule.

The minimum accepted bid rule, in section II.B.3, at 18, states, "The minimum accepted bid for any license or package will be the greater of: (i) the minimum opening bid; (ii) the bidder's own previous high bid on that [license or] package plus x%, where the Bureau will specify the value of x in each round; and (iii) the number of bidding units for the license or package multiplied by the lowest $/bidding unit on any provisionally winning package in the last 5 rounds."

2.1 With this possibility of multiple minimum accepted bids, it becomes critical to know when the relevant minimum accepted bid for a given round will be communicated.

The Procedures PN at section II.B.7, third paragraph, states, "Bidders must create packages on the package creation screen before they are permitted to bid on the packages... The bidding software will display allowable bids for each license and package created by the bidder." The Procedures PN at section II.B.3, ninth

paragraph, states, "[W]e do retain the discretion to limit minimum accepted bids when circumstances warrant, and to do so on a round-by-round, package-by-package and license-by-license basis. We believe that this discretion, along with our discretion to increase the time for the bidding rounds and review periods and the number of rounds per day, which we will exercise with sensitivity to the needs of bidders to study round results and adjust their bidding strategies, is sufficient to meet SBC/BellSouth's concerns, and those of others, of having adequate time in which to make decisions involving potentially hundreds of millions of dollars." (footnote omitted) In the next paragraph, the Procedures PN, at section II.B.3, tenth paragraph, continues, "It may therefore be the case that different bidders will have different minimum accepted bids on the same license or package."

Based on the foregoing statements in the Procedures PN, it appears that before a bidder can know with certainty the minimum accepted bid on a package, the bidder needs to create a package in the bidding software, during a round's bid submission phase. If there are 25 bidders, there is a potential for more than 100,000 different minimum accepted bids each round. If a bidder has to wait until the next round starts, it logs in to the bidding software, and enters a combination before the bidder learns what the minimum accepted bid will be, the bidder will have little, if any, time to think through primary and back-up strategies, or devise a new strategy. Additionally, how can a bidder know what the minimum accepted bid would be for a rival to bid on some package? It is also important for a bidder to be able to predict what its bid(s) in the current round will do to minimum accepted bids for the following round.

Previously, each report of round results included minimum accepted bids for the succeeding round. The report permitted authorized bidders to have the opportunity, if necessary, to consult with their bidder's decision makers about the bidder's tactical and strategic bidding possibilities, during the time after round results were available and before the next bid submission phase started. If the foregoing conclusion is correct, a bidder will not enter a round with a degree of certainty as to what the minimum accepted bid is on a license, a package that was previously bid on, or a package on which no bidder has yet to offer a bid.

If the foregoing conclusion is incorrect, please clarify exactly when a bidder will know the amount of a minimum accepted bid for an individual license or a package.

2.2 If we understand these rules correctly, we are also wondering what mechanisms could be used to match the predictability of minimum accepted bids that we came to rely on in previous auctions. Previously, under the exponential smoothing rule, changes in the minimum accepted bid increment were predictable. Hence, if a bidder was outbid, and the bidder's budget constraint allowed him to bid only 2.1% above the current high bid, the bidder would know how many waivers it would take, if there were no other activity on that license, before the bid increment would fall within 2.1%. If the number of waivers could be afforded, the bidder could use them, wait, and make his best bid on that license, still with the option to pursue a less expensive (though less valuable) backup strategy if that best bid were also outbid.

The Bureau makes a point in the Procedures PN that it strives to allow bidders a lot of flexibility to pursue backup strategies, but we do not understand how a similar strategy could be pursued here. To wait until the bid increment became small enough, the bidder needs some predictability of bid increments, which the exponential smoothing rule ensured. No such alternative appears to have been integrated into this set of procedures.

If the bidder adopts the last-and-best bid strategy which the Bureau suggests is the counterpart, it appears he gives up on switching to backup strategies. If he first pursues the licenses that are less expensive, with an eye to returning to make a last-and-best bid on his preferred license or package, it seems to us that he must pursue a second choice before finding out whether his first choice is available at an acceptable price. Please verify or correct our understanding of this.

2.3 How does part (i) of the minimum accepted bid rule change if the Commission lowers the minimum opening bid on one or more licenses?

The Procedures PN, at section II.B.2, second paragraph, states, "[T]he minimum opening bid [for a package] is the sum of the minimum opening bids of the individual licenses that make up the package." Subsequently, the Procedures PN, at section II.B.3, ninth paragraph, states, "[W]e do retain the discretion to limit minimum accepted bids when circumstances warrant, and to do so on a round-by-round, package-by-package and license-by-license basis." When the Bureau exercises its discretion, as described in the preceding quote, will the first quoted sentence still apply? In other words, will the sum of the minimum opening bids

of the individual licenses that make up the package always be at least, or always be at most, the minimum opening bid on the package?

2.4 When a bidder bids on a license or a package for the first time, is the bidder's previous high bid on the license or package taken to be $0, so that part (ii) of the minimum accepted bid rule can only be binding if the bidder has bid on the license or package before? Also, does it matter, for purposes of the applicability of such part (ii), if this bidder has bid on components of this package before?

For convenience, part (ii) of the minimum accepted bid rule reads, "the bidder's own previous high bid on that [license or] package plus x%, where the Bureau will specify the value of x in each round."

The questions may best be explained through the following examples.

Example 1: Suppose that Bidder X makes a bid on the NE-20 license, and another bid on the MA-20 license, both in round 2. Later, in round 473, Bidder X decides to create the package C473 = {NE-20, MA-20}. In round 473, on that package, suppose the Bureau has set x% equal to 10% for bid increments. Then it is entirely possible that a 10% increase on the sum of the round 2 bids on NE-20 and MA-20 would exceed the minimum accepted bid that would have been calculated either from part (i) or part (iii) of the rule above. Do only parts (i) and (iii) apply, or does Bidder X have to bid at least 10% over that sum of his round 2 bids?

Example 2: Suppose instead that the bids on NE-20 and MA-20 had been made in rounds 2 and 5, respectively, i.e., not in the same round. Would that change the calculation of the minimum accepted bid in round 473?

Example 3: Suppose instead that NE-20 and MA-20 had been bid on in round 2, but that Bidder X foregoes the creation of C473. Instead, suppose in round 474 he creates the package C474 = {NE-20, MA-20, CM-10}. Is part (ii) of the minimum accepted bid rule employed to say that he must bid at least 10% more for these three licenses than the sum he bid for two of them in round 2, or does part (ii) no longer apply?

Example 4: Suppose again that the two licenses had been bid on in different rounds; now would part (ii) imply that the minimum accepted bid on C474 must be at least $0, at least 10% over the larger of the two bids, or at least 10% over the sum of the two bids?

2.5 If the FCC is a placeholder on a license after a round, does the calculation of the minimum $/bidding unit across provisionally winning bids (see part (iii) of the minimum accepted bid rule) treat this license the same as others, that is, does it use the minimum accepted bid listed for the FCC, as a placeholder, as the basis for calculating the $/bidding unit on that license, and include this license when finding the minimum accepted bid? Or, is the minimum $/bidding unit calculation in a round calculated only on provisionally winning bids submitted by bidders, not the FCC, which is only a placeholder?

2.6 There is another apparent but unstated consequence of this minimum accepted bid rule. Suppose the auction proceeds a couple rounds, and there has been bidding

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on some packages and individual licenses, but no one has bid on license A, a 10-MHz license. Imagine that before round 3, the Commission decides to lower the $40 million (M) minimum opening bid on license A to $28 M, in hopes of encouraging an initial bid. The question is whether this $28 M becomes an acceptable bid on license A, or whether part (iii) of the minimum accepted bid rule overrides it, and if so when. We assume that the "in the last five rounds" wording in part (iii) means in all rounds if there have not yet been five rounds. Please clarify.

Suppose there are still no bids on license A, its minimum opening bid is reset to $28 million, and part (iii) of the minimum accepted bid rule yields prices of $2.86, $3.00, and $3.20 per bidding unit, in rounds 5, 6, and 7, respectively. Do these suppositions imply that the minimum acceptable bid on license A is actually $40 M in rounds 3-5, $42 M in round 6, and $44.8 M in round 7? If instead, there are times when only part (i) of the minimum accepted bid rule applies, even if part (iii) would yield a higher minimum accepted bid, can the Commission stipulate exactly when this would be the case?

2.7 It is unclear to us just when the minimum accepted bid on a license or a package is also the maximum permissible bid. The previously proposed rules specified that a bid on a license which had not been bid on before by any bidder had to be at the minimum accepted bid (minimum opening bid or current minimum accepted bid, if different). Only after someone had made a bid on a license could any bidder select 1-9 increments in his click-box. This is unclear in the current

version of the rules. Will the bidding software permit incremental bidding by any bidder placing a first bid or its first bid on any license or package?

Also, previously, after one bidder had bid on a license, all bidders became able to bid from 1 to 9 clicks on the clickbox for that license. The Procedures PN, however, institutes bidder-specific minimum accepted bid rules. Suppose that license or package A has been bid on by bidder Z in a prior round. In this round, bidder Y is bidding on A for the first time. Is it the case that bidder Z can bid his minimum accepted bid or higher bids via clickbox bidding on license A, but bidder Y can bid only his minimum accepted bid?

2.8 We would like to ask for specifics about the more general interaction between this bidder-specific minimum accepted bid rule and clickbox bidding. Suppose bidder Z makes a minimum accepted bid of \$160 M in round 1 on the combination C1 = {SE-10, GL-20, PA-10}, which has 56 M bidding units. Note that this is \$2.86/BU. Suppose the next time that bidder Z decides to place a bid on C1, the Bureau is announcing a bid increment of x=5%, and the lowest \$/BU of any provisionally winning bid in the last five rounds is \$3.30. This translates to the 5% increase implying \$168 M, but the \$3.30/BU implying a minimum accepted bid of \$184.8 M, which is a 15.% increase over Z's last bid. We assume your minimum accepted bid rule yields a bid of \$184.8 M, and this would correspond to bidder Z selecting 1 bid increment in his click box for C1.

Earlier in the rules (II.B.3, at 20), it says: "We believe, however, that the prior definition of a bid increment is one that is easy for bidders to understand. Accordingly, we believe our new definition of a bid increment should be

analogous to the old definition. Accordingly, for this auction, we are defining a bid increment as x% of the minimum accepted bid, where the minimum accepted bid is determined as discussed above. As under our previously established procedures, the Bureau will specify the value of x in each round." We wish to ask if the following is consistent with what is meant by this rule, for the example just introduced. Is the bid increment 5% of $184.8 M ($9.24 M), so that 1 click corresponds to $184.8 M, 2 to $194.04 M, and 9 to $258.72 M? Does this mean that, even though different bidders will have different minimum accepted bids for the same license or package, for all bidders who are allowed to bid more than the minimum accepted bid on any license or package,[1] selecting 2, 3, or 4 from the click box will yield a bid which is 5%, 10%, or 15%, respectively, more than selecting 1? If so, for any bidder whose last bid on the same package or license was above the minimum $/bidding unit from part (iii) of the rule, the arithmetic difference between his last bid and the minimum accepted bid will be less than the difference between adjacent choices above the minimum accepted bid. For example, if the last bid was $100 M, and x = 10%, then the minimum accepted bid is $10 M higher, but each step in the click box is $11 M above the previous bid, so that a 1 is $110 M, a 2 is $121, and a 9 is $198 M.

2.9 Please clarify the actual mechanics of how a bidder that holds a provisionally winning bid would renew this bid. When a bidder that holds a provisionally winning bid going into a round accesses the bidding software, what will the

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[1] This assumes that a bidder's first bid on a license or package cannot exceed the minimum accepted bid.

bidding screen look like for that bidder with the provisionally winning bid from the previous round? Will the screen for that bidder for that license or package have a "renew" button on it? Or will renewal correspond to selecting 1 bid increment in the clickbox, with the smallest allowed increase in this bid corresponding to 2 bid increments in the clickbox?

3. For practical business reasons, we need an operational definition of an accepted bid. We would like to propose a definition and ask your concurrence. Our proposed definition depends on answers to some questions already raised: A bid will be accepted if and only if the bidder has sufficient eligibility to submit the bid and it fits into one of the following categories: [a] it is this bidder's first bid on a particular license or package, and it is exactly equal to[2] the larger of: the minimum opening bid (perhaps as updated), and the product of the number of bidding units times the lowest \$/BU on any provisionally winning bid in the last five rounds, and this bidder has never submitted a last-and-best bid; [b] it matches a bid which is selected via 1 through 9 bid increments in click-box bid levels on a package or license for which this bidder has bid before, and this bidder has never submitted a last-and-best bid; [c] it is a renewal of a bid that was a provisional winner at the end of the last round, and this bidder has never submitted a last-and-best bid; [d] it is a renewal of a bid made in some prior round, not necessarily made or renewed in the immediately preceding round, but where there have not been two or more intervening rounds in which this bidder made one or more new bids but did not renew this bid, and this bidder has never submitted a last-and-best

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[2] *See* n.1.

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bid; [e] it is a last-and-best bid which satisfies the rules for such bids, and this bidder has not submitted a last-and-best bid in any prior round. Is it correct that a bid in any one of these categories will be accepted? Is it correct that a bid fitting none of these categories definitely will not be accepted?

4. Please clarify how the relationship between "mutually exclusive bids" and "provisionally winning bids" affects the holder of a provisionally winning bid.

Bids by a given bidder are mutually exclusive across rounds. (Section II.B.6.b, eighth paragraph, provides that, ". . . the bids a bidder makes in the current round [are] mutually exclusive with the bids that same bidder made in prior rounds" and section II.B.6.b, tenth paragraph, provides that, ". . . by considering only a bidder's two most recent rounds in which it made a bid (either an accepted new bid or a renewed bid), plus any provisionally winning bids, we have essentially cancelled all of the bidder's other bids.") In light of the foregoing, please comment on whether the following scenario is correct and, if not, where our analysis is flawed in light of the rules laid down in the Procedures PN.

Scenario 4: Only three bidders have bid on license A or packages containing A. Consider any round in which each of these three bidders has another bid, mutually exclusive from its bid on A, that is involved in the allocation of licenses that maximizes provisional revenue (by which we mean the revenue that would be attained if there were no bidding after the current round). In such a round, it appears that license A would revert to the FCC as the provisional winner. Is that correct?

Now suppose that in the following round, one of these bidders has an old bid on A that is available to the provisionally winning bid algorithm, and no other component of the provisionally winning bids was submitted by this bidder. It would appear that its bid on license A becomes a provisionally winning bid. (However, what would happen if this bid had been placed at the minimum opening bid, which was also the bid level at which the FCC held the license? Would the bidder necessarily supplant the FCC? Or would the tie be decided in favor of the current holder, the FCC? Or would the tie be broken randomly?)

5. Handling eligibility during a multi-round package auction involves the following process: [a] the rules specify a mapping from a bidder's bids in a round into a level of activity credit for that round, [b] the rules specify a transition from eligibility going into that round and activity credit in that round into eligibility going into the following round, and [c] the rules specify a second mapping from the level of eligibility a bidder takes into the following round and the collections of bids which that bidder can simultaneously make in that following round. We are having a lot of trouble trying to understand part [c] of this process, particularly in terms of how it relates to overlapping bids, and to issues of bid retention and renewal.

5.1 To begin with, we have not found in the rules a clear statement of which bids a bidder can make in the first round. Section II.A.2 (at 9) covers maximum eligibility, and states that the number of bidding units for a package will be the sum of the bidding units for the licenses comprising the package. It also states that rules relating maximum eligibility to upfront payments are unchanged. This

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is clear as far as it goes, but we have not found any statement of which bids a bidder with a particular level of eligibility can make in round 1, except for footnote 48 (II.A.2, at 9): "Because, as described below, we are modifying the activity rule to account for mutually exclusive bids, bidders will never need to purchase more eligibility than the total bidding units associated with all licenses."

5.2 Perhaps, to make it plain precisely what is unclear to us, it will help to describe how rules specifying part [a] of this process do not by themselves clarify part [c] for us. At the end of a round, a bidder has made particular bids. There is one set that contains all the bids made in that round. Together with a bidder's provisionally winning bids from the previous round, part [a] maps that set into a level of activity credit. The critical part of the activity credit rules here is that part [a] takes the largest number of bidding units that could be covered via non-overlapping bids by a bidder to determine that bidder's activity credit (II.A.3, at 11). However, the mapping in part [c] cannot be described as simply the inverse of the mapping in part [a]. Part [a] works with one set of bids, those that a bidder made, as an input to get a level of bidding units as its output. Part [c] has a level of bidding units as its input, but has to produce as its output not one, but all the sets of bids that a bidder with that much eligibility could make in that round. Part [a] also does not have to be concerned with whether the bids are new bids or renewed bids or last-and-best bids; part [c] has to specify whether it makes a difference to which bids a bidder can make whether particular bids among them are renewed and/or last-and-best.

5.3 An interpretation of the eligibility rule for round 1 which would appear to us to be consistent with the Commission's intentions expressed in the Procedures PN is as follows: a bidder can submit bids on any individual licenses and on a maximum of twelve packages so long as the activity credit which these bids generate does not exceed the number of bidding units of that bidder's initial eligibility. This would imply that if a bidder could bid on some package A, he could also bid on any overlapping package B that involves no more bidding units than A. We seek your concurrence on this interpretation.

5.4 After round 1, complications arise due to retained bids, provisionally winning bids, and renewed bids.

5.4.1 Consider first the following, which we label "scenario 5.4." The auction reaches round 272, and bidder Z has used up all his waivers, and has no provisionally winning bids at the end of round 271. In round 272, bidder Z makes one new bid on package C272, which comprises 126 M bidding units, which is his current eligibility. This bid is provisionally winning at the end of round 272. In round 273, bidder Z does not renew this bid, but makes a new bid on package C273, which comprises 42 M bidding units. Neither of these bids is a provisional winner at the end of round 273. In round 274, bidder Z still has 126 M eligibility, correct? Suppose his only activity is to renew his bid on C273. Then his eligibility for round 275 falls to 84 M (under a 50% activity requirement; with a 66% activity requirement, his eligibility would fall to 63.64 M, or effectively to 56 M), no matter what bids of his become provisional winners at the end of the round. In particular, suppose his bid on C272 now becomes a provisional winner

after round 274. If we understand the rules correctly, this implies that he cannot renew or raise his own provisionally winning bid in round 275 or any later round. If this scenario is correct, a bidder who understands the rules to be that provisionally winning bids grant activity credit, might well falsely assume that the rules always allow him to renew or raise any bid of his that is provisionally winning, when in fact this may not always be the case. Please verify our interpretation of this scenario.

5.4.2 Here are other examples of general questions that arise in trying to understand how eligibility constrains the collection of sets of bids that can simultaneously be made in a round that is not round 1. Is the complete collection of sets of bids that a bidder could make in a round if he had no provisional winners at the end of the prior round still available to him, in the event that he does not renew any of his provisionally winning bids? Or, if he has sufficient eligibility to be allowed to renew a provisionally winning bid, is the bidder constrained to factor into his bidding, whether or not he renews the provisionally winning bid, that the bid will continue to be considered in the calculation of his eligibility to place other bids? For example, suppose bidder Z makes a new bid in round 41 on package C41, which involves 84 M bidding units. At the end of round 41, this bid is provisionally winning, and Z enters round 42 with 98 M eligibility. If he chooses not to renew his bid on C41, is he permitted to bid on a 28 M bidding-unit package or license that does not overlap with C41?

5.4.3 Suppose bidder Z bids on package C52 in round 52, and on distinct package C53 in round 53, and then takes waivers in rounds 54-56. Can he renew

his bid on C52 in round 57, no matter whether it has been a provisional winner in any of rounds 52-56?

5.4.4 Suppose in the above scenario a bid made by bidder Z before round 52, say in round 49, becomes a provisional winner in round 52, and remains a provisionally winner through rounds 53-56. Does this affect whether his C52 bid can be renewed in round 57? Suppose Z takes a waiver in round 57, and now his bid from round 49 is not a provisionally winning bid. Is it the case that in round 58, he could renew his bids from rounds 52 and 53, but not his round 49 bid that was a provisionally winning bid in rounds 52-56?

5.4.5 Suppose bidder Y submits a new bid on package C21 in round 21, and submits a new bid on a distinct package C22 in round 22. None of Y's bids are provisional winners at the end of round 22. In round 23, Y renews his bid on C21, and also makes a new bid on distinct package C23. Suppose that again none of Y's bids are provisional winning bids. Is he permitted to renew his bid on C21 in round 24? Suppose his activity in round 24 is solely the submission of a new bid on distinct package C24. What bids by Y are considered by the provisional-revenue-determining algorithm for round 24? If none of Y's bids are provisional winners at the end of round 24, which of his bids is he permitted to renew in round 25? Which bids die, for good, if he does not renew or raise them in round 25?

6. We have major concerns about the treatment of ties, on which the rules appear incomplete and are presented in ways that may cause concern to bidders.

6.1 As background, we proposed that the Bureau commit itself to specifying x% minimum bid increments that would cap the absolute size of the minimum bid increase over a previous bid on any package at $250 M. The Procedures PN responds: "While we are mindful of SBC/BellSouth's concerns, we decline to adopt their proposal and do not restrict our discretion regarding the size of minimum accepted bids." (II.B.3, at 19) This issue is relevant and of concern to potential bidders in the context of how the Commission has proposed to resolve ties.

6.2 The discussion of ties in the Procedures PN is possibly incomplete because it is all expressed in terms of a situation where a bidder loses a tie-breaker to a rival bidder, who has submitted an identical bid for the same license or package (a "face-to-face" tie). Applications of combinatorics indicates that, when at least three bidders can bid for twelve assets on up to twelve chosen packages, there are literally millions of mathematically distinct structures of bids that could be submitted yielding a tie. That is, these comprise different ways in which more than one collection of bids can be consistent and maximize provisional revenue. Of these, a few dozen are face-to-face ties. The millions of others ("indirect ties") are more like the following simple scenario. There are three sets of consistent bids, A, B, and C. Each yields exactly the maximum level of provisional revenue. A = {A1, A2, A3}, where A1 = {NE-20, MA-20, SE-20, GL-20, CM-20, PA-20, PA-10}, A2 = {NE-10, GL-10, CM-10}, and A3 = {MA-20, SE-20}. B = {B1, B2, B3, B4}, where B1 = {NE-20, GL-20, CM-20, PA-20}, B2 = {MA-20, SE-20}, B3 = {NE-10, MA-10, SE-10}, and B4 = {GL-10, CM-10, PA-10}. C =

{C1, C2, C3, C4, C5}, where C1 = {NE-20, NE-10, PA-20, PA-10}, and each of C2-C5 is a regional aggregation. Note that no bidder has submitted a bid that is tied with any other bid; it is possible to have this tie with the collections A, B, and C consisting of twelve different dollar amounts.

6.3 When these millions of distinct structures of indirect ties are considered, it is harder to follow and interpret properly the Procedures PN rules about ties.

6.3.1 First, the complete description provided of the tie-breaking procedure is that the bids will be permuted in accordance with the output of an approved pseudo-random-number generator (footnote 102, II.B.6, at 22). For the rare case of a face-to-face tie, this might imply that each of the tied bidders has an equal chance of his bid becoming provisionally winning. But it does not specify what will happen in an indirect tie, like in the example. If the algorithm performs no pre-processing, and only considers a consistent set, if such set yields a level of provisional revenue which is strictly higher than any level of provisional revenue already found, then permuting the order in which bids entered the algorithm would have an uneven effect in nearly all indirect ties. In the scenario above, A would be chosen as the set of provisionally winning bids 44.6% of the time (the chances are 25 in 56 that all of A's bids are in the algorithm before the last bid is in for both B and C); B 31.7% of the time (20 in 63), and C 23.6% of the time. Such an algorithm turns random ordering of bid submission into favoritism for larger packages (if the example were changed to make the collection A simply a global bid for all twelve licenses, it would win a tie-breaker in such an algorithm 90% of the time).

6.3.2   However, the situation could be even more problematic in practice.  The Procedures PN specifies that the algorithm will employ ILOG CPLEX software, version 6.5 (footnote 101, II.B.6, at 22).  These procedures employ pre-processing designed to make branch-and-bound techniques more efficient in finding a solution.  The pre-processing techniques reorganize the order in which input is considered.  For example, bids which come close to fitting neatly into rows (bids on packages comprised of only 20-MHz licenses, for example) will be grouped into adjacent positions by the pre-processor before the actual algorithm that attempts to maximize provisional revenue goes to work.  In so doing, the pre-processor will undo the randomness that was generated by permuting the order in which bids are entered into the algorithm.  That is, for nearly all of the millions of mathematical structures that indirect ties can take, the algorithm will always break any given tie in exactly the same way, independent of the randomization.  For the particular pattern of bids above, we have not studied the intricate working of CPLEX algorithms and their pre-processing to know for sure whether A always wins the tie-breaker, or C always wins (we can be fairly confident that B always loses).  While we have not studied that case, if the rules make tie-breaking potentially a billion-dollar issue for bidders and provide no randomness (merely intricacy) in tie-breaking procedures, it will pay sophisticated bidders to learn over the next two months which packages are disadvantaged given the procedures specified in the Procedures PN.  If some other package is not so disadvantaged, and not dramatically less valuable, a sophisticated bidder will avoid a disadvantaged package, without regard for the efficiency consequences.  For

example, if it is found that C always wins in ties like this scenario, but always loses to collections involving D1 = {NE-20, MA-20, SE-20, GL-20, CM-20, PA-20, NE-10}, we would definitely see bidders, who had investigated the inner workings of CPLEX, eschew bidding on A1 in favor of D1, even early in the auction, if bidders believed there was a chance that the minimum bid increment on a package of such size might ever approach $250 M.

6.3.3    There is another consideration which could create an unusual anomaly if the Commission were not to use a CPLEX-style algorithm, but were actually to implement tie-breaking via randomly permuting the order in which bids were introduced to an algorithm which maintained the integrity of the resulting random permutation. Consider scenario 6.3: the auction reaches a stage where only three bidders remain active, and round 188 ends in an indirect tie. The provisional winners are a new bid on the nationwide 20 package by bidder Z and a bid on the nationwide 10 by bidder Y that was provisionally winning after round 187. Y does nothing in round 188. The collection of bids that lost out in the tie breaker are a new bid by bidder X for a package of four 10-MHz licenses and all six 20-MHz licenses, and individual bids on the remaining two licenses, one by bidder W in round 3, and the other by bidder V in round 42. Bidders W and V have long since lost all their eligibility. Bidder X now faces a $3 billion (B) decision about whether to raise his tying but losing bid, or to use a last-and-best bid, or to concede defeat. He needs more time than an hour or so to make this decision, and he realizes that the next round, 189, is the last of the day. So he uses a waiver, to give him until the next morning to decide. However, with the waiver as the only

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activity, as we understand the rules, the same set of bids would go into the algorithm for round 189. If the Commission's statement that the order of bids will be permuted means a new random result of tie-breaking, should the algorithm enter the bids by V, W and X before at least one of the bids by Y and Z, **even with no new bids, the set of provisional winners will switch**. In this scenario, suddenly at the end of the day, bidders Y and Z find out that they have a very tough decision to make by morning. If both Y and Z take waivers, and neither knows whether the other is doing so, then the auction is over. Y faces a $750 M minimum bid increase, Z a $2.25 B minimum bid increase. Either could make a last-and-best bid, which would be a risk of at least the same order of magnitude. For example, if Y raises his own bid by any last-and-best bid, this almost certainly makes Y a winner if X employs his last-and-best bid before Z employs his, and almost certainly makes Y a loser if Z does that before X. With such a financial commitment at stake, no bidder would wish to face such capricious uncertainty. Is it correct that every aspect of this scenario is consistent with the rules as stated in the Procedures PN?

6.3.4    The previous scenario is not pleasant with CPLEX either. If the auction reaches a point where we have the bids by X , Y and Z, and the old bids by inactive V and W, and no matter how the bids are randomly permuted, the tie-breaking algorithm is always going to break the tie in favor of the nationwide 20 and the nationwide 10, resulting in unjust treatment to X. If the tie-breaking algorithm always goes the other way, it just changes to whom the unjust treatment is directed.

6.4 Since click-box bidding was introduced, several bidders have indicated a desire to be allowed to alter bids upward by small amounts to avoid ties. To our knowledge, no bidder has argued in ex parte filings to the contrary (that is, that such opportunities be disallowed). Nor has any bidder, to our knowledge, requested that the insignificant digits of bids be made public. In contrast with this, the one mechanism the Procedures PN rules allow bidders for avoiding ties, last-and-best bids, appears also to be addressing only face-to-face ties. In the scenario presented above, it is not at all clear how one of the bidders who loses in the tie-breaker can substitute a last-and-best bid on the package or license that was part of a provisional-revenue-maximizing but not provisionally-winning collection for the opportunity to avoid ties by adding a chosen and privately disclosed small amount to the bid. We do not see how the example presented in II.B.6 (at 22) has a counterpart for the indirect tie. Perhaps the Bureau has a counterpart to show us that we overlooked.

7. We also do not understand how the last-and-best bid rule and the mutual exclusivity rule are supposed to co-exist. Consider the following scenario (which is highly simplified; much more complicated problems can be constructed, and might arise). It involves four packages, X1, X2, Y1, and Y2. Each of these packages consists of four licenses, 30 MHz in two regions. The scenario concerns two bidders, X and Y. X is interested in acquiring X1 or X2, Y in Y1 or Y2. X considers X1 to be worth 20% more than X2, and Y considers Y1 to be worth 20% more than Y2. Each values their second choice at $320 M, hence their first choice would be worth $384 M. However, each has a budget constraint of $350

M for the auction. Each begins the auction with minimum opening bids: X makes the minimum bid on X1, and Y on Y1 in round 1. Each does nothing in any round in which it has a provisional winner. In any round in which it has no provisional winner, X makes the minimum supplanting bid (the smallest bid that would make his bid a provisional winner if there were no other activity in the current round) on X1 unless the minimum supplanting bid on X2 is $64 M less, in which case he makes the minimum supplanting bid on X2. Y follows the corresponding rule to determine whether to bid on Y1 or Y2. In some round RX1 this rule leads X to bid $342 M on X1, but this bid loses out on a tie-breaker. His new minimum accepted bid on X1 exceeds $350 M. If X were to submit a last-and-best bid on X1 in the next round, he would lose his chance to compete for X2, so he switches and competes for that. In some round RX2, he bids $313.5 M for X2, and loses on a tie breaker. The minimum accepted bid on X2 now exceeds $320 M. The only thing left for X to do is to submit his last-and-best bid(s). He can wait out doing that while his waivers diminish, but pretty quickly he reaches a round where he can wait no more. The corresponding events happen to Y: in some round RY1, he loses a tie-breaker on Y1, and cannot meet the new minimum accepted bid, then in round RY2, he loses a tie-breaker on Y2, and cannot meet the new minimum accepted bid on it. So Y also has to make his last-and-best bids. It is at this point that their situations diverge for the first and only time. The packages X1 and X2 both contain licenses in the SE region, so X can submit, for example, a last-and-best bid of $350 M on X1 together with a last-and-best bid of $319.6 M on X2. Because of the overlap, he knows he has not put

$669.6 M on the table. Y1 and Y2, however, do not overlap, so Y has to choose between the two corresponding bids, and guess whether $350 M on Y1 is less likely to be outbid, or whether nearly $320 M on Y2 has a better chance of winning. Is this interpretation of the rules correct? Is this apparent situational dilemma intentional? That is, ought the overlap give X approximately twice the chances of winning that it gives Y, or should the rules be adjusted to allow a bidder to specify the mutual-exclusivity relations among his last-and-best bids?